CLAIMS

What is claimed is:

1. An etching apparatus for a semiconductor wafer, comprising:

a vacuum chamber;

a support for the semiconductor wafer in the chamber; and

a gas injector,

wherein the gas injector comprises:

a first gas supplier,

a second gas supplier independently providing gas from the first gas supplier,

a gas distributor plate having an upper central zone and an upper edge zone and a lower central zone and a lower edge zone, and

a showerhead opposing the gas distributor,

wherein an amount of reaction gas supplied to the upper central zone and the upper edge zone of the gas distributor is independently controlled.

2. The etching apparatus for a semiconductor wafer according to claim 1, wherein the gas distributor plate has a loop-type upper partition wall protruding from the central zone of an upper side of the plate, and a loop-type bottom partition wall protruding from the central zone of a bottom side of the plate.

3. The etching apparatus according to claim 1, wherein a first gap is formed between the gas distributor and the gas suppliers, and a second gap is formed between the gas distributor plate and the showerhead.

4. The etching apparatus according to claim 3, wherein at least one of uniformity of density of plasma, deposition speed, and etching speed is controlled.

5. The etching apparatus according to claim 1, wherein a plurality of the gas distributor plates are provided between the gas suppliers and the showerhead.

6. The etching apparatus according to claim 2, wherein the upper partition wall divides a first gap into a first central zone and a first edge zone, and the bottom partition wall divides a second gap into a second central zone and a second edge zone.

7. The etching apparatus according to claim 6, wherein at least one of uniformity of density of plasma, deposition speed, and etching speed is controlled.

8. The etching apparatus according to claim 6, wherein either one of the gas suppliers connects to the first central zone, and the other one connects to the first edge zone.

9. The etching apparatus according to claim 8, wherein the first central zone has a plurality of first gas distribution holes connected with the second central zone and passing through a planar side of the gas distributor plate, and the first edge zone has a plurality of second gas distribution holes connected with the second edge zone and passing through the planar side of the gas distributor plate.

10. The etching apparatus according to claim 9, wherein the first gas distribution holes are alternately arranged with the second gas distribution holes.

11. The etching apparatus according to claim 6, further comprising an MFC (Mass Flow Controller) independently controlling amounts of reaction gases respectively supplied into the first central zone and the first edge zone.

12. The etching apparatus according to claim 8, further comprising an MFC (Mass Flow Controller) independently controlling amounts of reaction gas respectively supplied into the first central zone and the first edge zone.

13. The etching apparatus according to claim 9, further comprising an MFC (Mass Flow Controller) independently controlling amounts of reaction gas respectively supplied into the first central zone and the first edge zone.

14. The etching apparatus according to claim 6, further comprising a control valve independently supplying the reaction gas into the first central zone and the first edge zone.

15. The etching apparatus according to claim 14, wherein the control valve is controlled automatically.

16. The etching apparatus according to claim 8, further comprising a control valve independently supplying the reaction gas into the first central zone and the first edge zone.

17. The etching apparatus according to claim 16, wherein the control valve is controlled automatically.

18. The etching apparatus according to claim 9, further comprising a control valve independently supplying the reaction gas into the first central zone and the first edge zone.

19. The etching apparatus according to claim 18, wherein the control valve is controlled automatically.

20. The etching apparatus according to claim 9, wherein the gas distributor plate contains aluminuim alloy, and the showerhead contains silicon.

21. A method of controlling uniformity of factors contributing to uniform etching of a semiconductor wafer, comprising:

supplying a reaction gas from first and second gas suppliers;

flowing the supplied reaction gas from the first supplier into a first central zone in a first gap between the gas suppliers and a gas distributor;

flowing the supplied reaction gas from the second supplier into a first edge zone in the first gap;

flowing the gas from the first central zone into a second central zone of a second gap between the gas distributor and a showerhead;

flowing the gas from the first edge zone into a second edge zone of the second gap;

injecting the gas from the second central zone into the chamber; and

injecting the gas from the second edge zone into the chamber.

22. The method according to claim 21, further comprising:

applying RF power to the gas suppliers;

forming the gas distributor as an upper electrode and a support holding the wafer as a bottom electrode;

converting the reaction gas into plasma using the upper and bottom electrodes; and

ejecting a flue gas after etching.

23. The method according to claim 22, further comprising independently controlling a supply of reaction gas into the central zone and edge zone of the chamber.

24. The method according to claim 23, wherein independently controlling the supply of reaction gas comprises increasing an amount of reaction gas in a zone having less gas and decreasing an amount of reaction gas in a zone having more gas.

25. The method according to claim 24, wherein the independently controlling the supply of reaction gas comprises:

heating a fluid by heating material positioned in the path of the fluid flow,

detecting a change in temperature,

estimating a speed of the fluid and an amount of the fluid flowing by the detected change, and

controlling a valve with an electric signal based on the estimated speed and fluid amount.

26. The method according to claim 21, wherein the factor controlled contributing to the uniform etching is at least one of density of plasma, deposition speed, and etching speed.

27. A gas injector for an etching apparatus, comprising:

a first gas supplier;

a second gas supplier independently providing gas from the first gas supplier;

a gas distributor plate having an upper central zone and an upper edge zone and a lower central zone and a lower edge zone; and

a showerhead opposing the gas distributor,

wherein an amount of reaction gas supplied to the upper central zone and the upper edge zone of the gas distributor is independently controlled.

28. The gas injector according to claim 27, wherein the first or the second gas supplier connects to the upper central zone and the other connects to the upper edge zone.

29. The gas injector according to claim 28, wherein the upper central zone is connected with the lower central zone and the upper edge zone is connected with the lower edge zone.